



FAA National Software Conference, May 2002

Field-Loadable Software

Field-Loadable Software
N8110.77/95 and
N8110.79/93



Will Struck
FAA Transport Airplane Directorate
Standards Staff ANM-111
will.struck@faa.gov

1

Two Field-Loadable Notices

- N8110.77/95* - "Guidelines for the Approval of Field-Loadable Software"
- N8110.79/93* - "Guidelines for Approval of Field Loadable Software by Finding Identity through the Parts Manufacturer Approval Process"

* - New numbers assigned

2

FAA National Software Conference, May 2002

Field-Loadable Software

Purpose of Notice .77/.95

- Purpose:
 - To Provide Guidelines for Approving Field-Loadable Software (FLS)
 - To Clarify DO-178B FLS Guidance

3

History of FLS Notices

- History
 - ACSEP Evaluation - May 1997
 - FLS Guidance Unclear
 - PMA Policy Did Not Specifically Address Software
 - Notice Drafted to Address FLS and PMA
 - Notice Routed for Comment - Jan. 1998
 - Comments Indicated Need for 2 Notices ⇒ N8110.77 and N8110.79
 - New numbers assigned - Jan 2001

4

FAA National Software Conference, May 2002

Field-Loadable Software

DO-178B References to FLS

- Field-Loadable Software (FLS) and Loading References:
 - System Design: Sections 2.0 and 2.5
 - SW Process: 6.4.3a., 7.2.1d., e.; 7.2.8, 8.3g.
 - SW Data: 11.1g., 11.2c.(3), 11.4b.(8), (9); 11.10g., 11.11, 11.15, 11.16, 11.20g.

5

Notice Outline

- Section 1: Purpose
- Section 2: Distribution
- Section 3: Related Publications
- Section 4: Definitions
- Section 5: Background
- Section 6: Earlier Versions of DO-178
- Section 7: Approval Information
- Section 8: Installation Information
- Section 9: Maintenance and Part Marking

6

FAA National Software Conference, May 2002

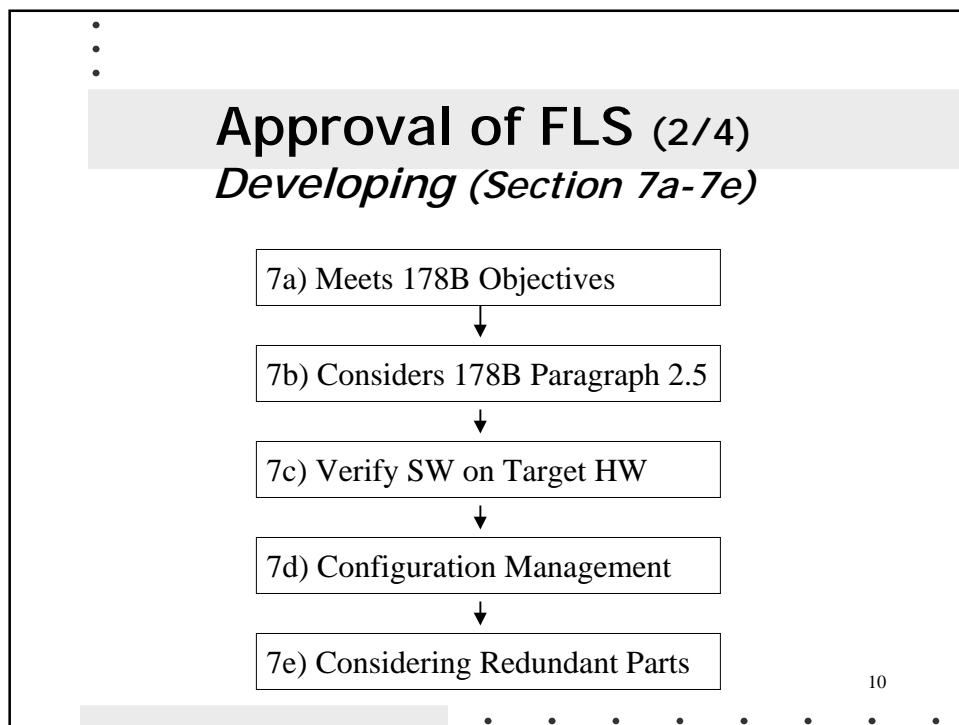
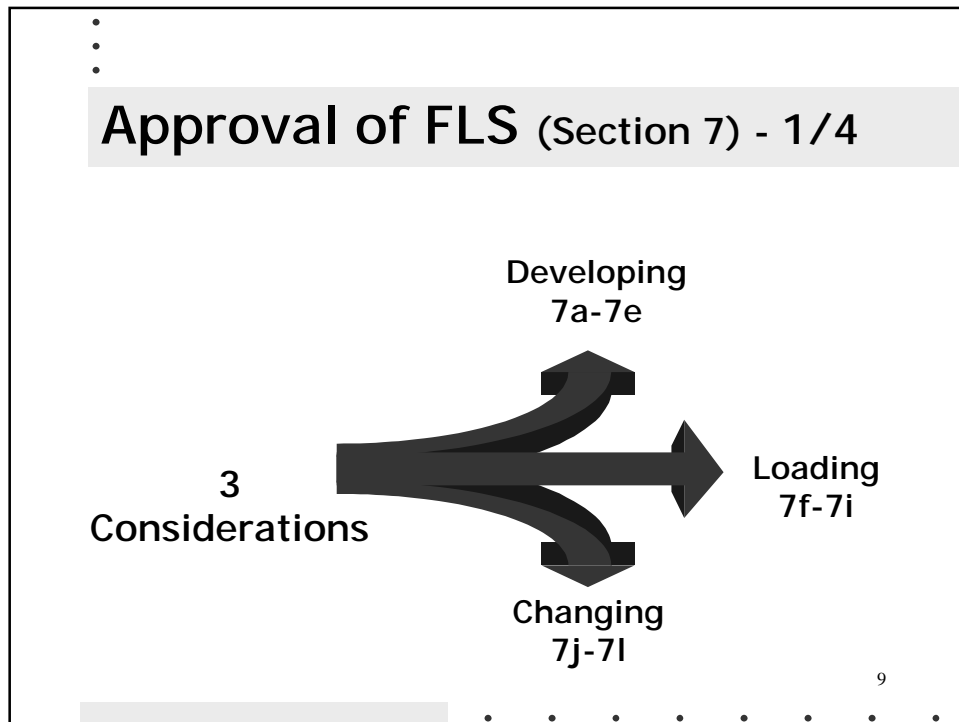
Field-Loadable Software

Definitions (Section 4)	
Field-Loadable Software	Software that can be loaded without removal of the equipment from the aircraft installation.
User-Modifiable Software	Software intended for modification by the airplane operator without review by the certification authority, airframer, or equipment manufacturer.
Option-Selectable Software	Software that contains approved and validated components that may be activated by the user.

Examples (Section 4)	
<ul style="list-style-type: none">• Field-Loadable Software<ul style="list-style-type: none">– Engine Control Software– Flight Control Software– Boeing 777 Has Many Systems With FLS• User-Modifiable Software<ul style="list-style-type: none">– Non-Required, Airline-Specific Electronic Checklists• Option-Selectable Software<ul style="list-style-type: none">– Selection Of Sensors For An FMS	

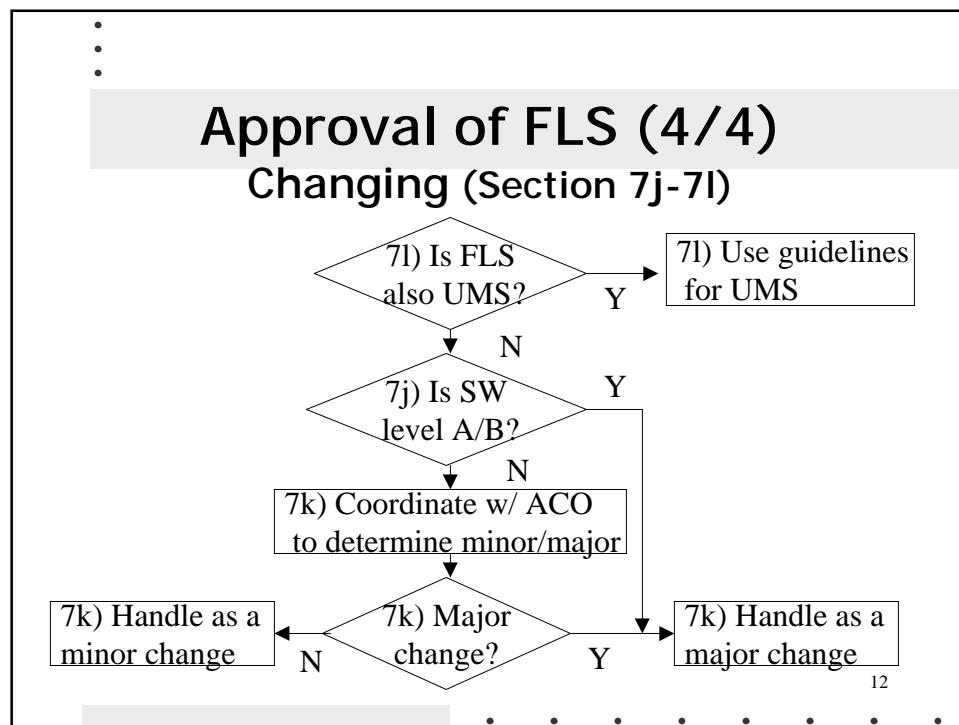
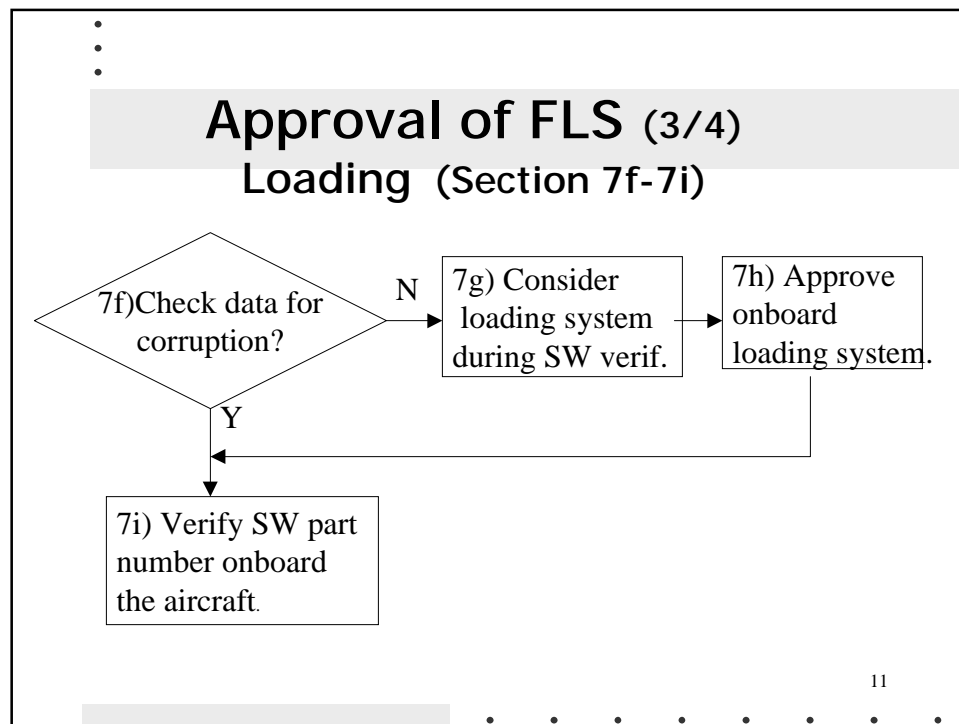
FAA National Software Conference, May 2002

Field-Loadable Software



FAA National Software Conference, May 2002

Field-Loadable Software

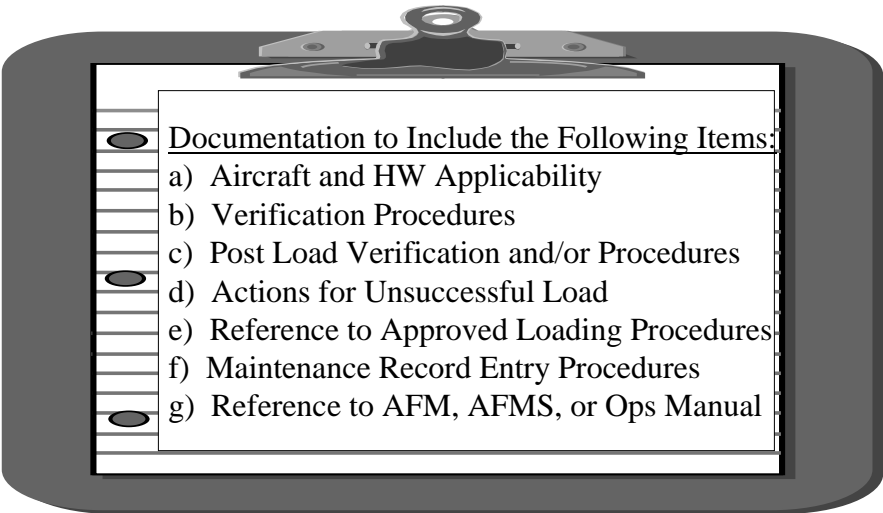


FAA National Software Conference, May 2002

Field-Loadable Software

...

Installation of FLS (Section 8)



Documentation to Include the Following Items:

- a) Aircraft and HW Applicability
- b) Verification Procedures
- c) Post Load Verification and/or Procedures
- d) Actions for Unsuccessful Load
- e) Reference to Approved Loading Procedures
- f) Maintenance Record Entry Procedures
- g) Reference to AFM, AFMS, or Ops Manual

...

...

Maintenance & Part Marking of FLS (Section 9) - 1/2

- 9a) Maintenance Procedure in Aircraft Maintenance Manual
- 9b) Procedure to Include Reading of SW Version
- 9c) Procedure to Include Part Number in Maintenance Records
- 9f) Changes Reflected in Appropriate Manual or Logbook

14

...

FAA National Software Conference, May 2002

Field-Loadable Software

...

Maintenance & Part Marking of FLS
(Section 9) - 2/2

The diagram shows two procedures for verifying Field-Loadable Software (FLS). On the left, labeled '9d) Procedure to Verify SW Load', a software loadable unit (SLU) is shown with a 'SW P/N:' label pointing to it and a 'HW P/N:→' label pointing to a computer monitor. On the right, labeled '9e) Procedure to Verify Nameplate & SW Load', a larger hardware unit is shown with an 'LRU P/N:' label pointing to its top surface.

9d) Procedure to Verify SW Load

9e) Procedure to Verify Nameplate & SW Load

...

...

Parts Manufacturer Approval
of Field-Loadable Software
N8110.79/93*

The diagram shows a globe on the left and a software loadable unit (SLU) on the right. A 'PMA' stamp is shown being applied to the SLU. The stamp is a rectangular box with 'PMA' written inside, and a stylized key icon is shown above it.

* New Number

16

...

FAA National Software Conference, May 2002

Field-Loadable Software

⋮

Purpose and History

- **PURPOSE OF NOTICE:**
 - Provides Guidelines for Approving FLS Through PMA
 - Limited to Identity With or Without a Licensing Agreement
 - Does Not Cover Test and Computation
- **HISTORY**
 - Started As Part of N8110.77 But Was Separated For Clarity

17

⋮

Technical Information

- FLS Is Beneficial to Airlines and Applicants
- Order 8110.42, "PMA Procedures," Does Not Specifically Address Software
- CFRs 21.301, 303, and 305 Do Not Specifically Address Software
- Data Being Loaded Is Approved, Not Media

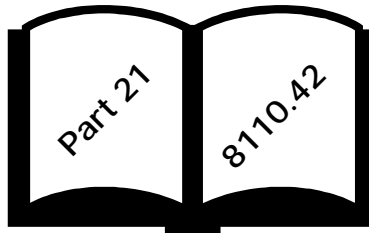
18

FAA National Software Conference, May 2002

Field-Loadable Software

Procedures (Section 5) - 1/2

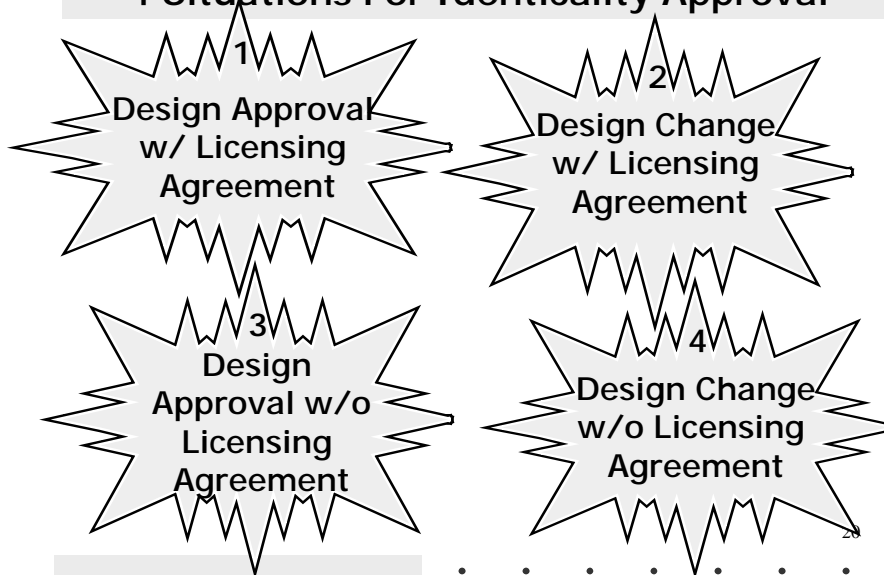
- Follow Part 21 and Order 8110.42 in Conjunction With the Software-Specific Procedures in N8110.79/93*



19

Procedures (Section 5) - 2/2

4 Situations For Identity Approval



FAA National Software Conference, May 2002

Field-Loadable Software

•
•
•

Design Approval: Identity with Licensing Agreement (Section 5b(1)a)

- Reference 8110.42, 8(a)(3)(a)
- FLS Should Be Approved Through TC, STC, ATC as Described in N8110.77/95*
- FLS Should Be Installed Via Service Bulletin Or Similar Means
- Configuration Management Process Should Be In Place To Assure Software Part Number, Hardware Part Number, Aircraft Series, etc. Are Accurate

21

•
•
•

Design Change: Identity with Licensing Agreement (Section 5b(1)b)

- Reference 8110.42, 8(h)(5)
- Applicant Should Coordinate Change With TC, STC, ATC Holder
- FAA Notice 8110.85 "Guidelines for the Oversight of Software Change Impact Analysis Used to Classify Software Changes as Major or Minor", dated May 11, 2000
- Determine Minor/Major Classification
 - Major change ⇒ 8110.42 8(h)(5)(a)
 - Minor change ⇒ 8110.42 8(h)(5)

22

FAA National Software Conference, May 2002

Field-Loadable Software

•
•
•

Design Approval: Identity w/o Licensing Agreement (Section 5b(2)a)

- Order 8110.42, 8(a)(3)(b) - Parts Must Be Identical In "All Respects"
- FLS Should Be Identical To The Software On The TC, STC, ATC Approval
 - Bit-by-bit Comparison
 - Evidence of Identical Type Design Data - DO-178B Section 9.4

23

•
•
•

Design Change: Identity w/o Licensing Agreement (Section 5a(2)b)

- Change Considered Major
- Reference 8110.42, 8(h)(5)(a)

24

FAA National Software Conference, May 2002

Field-Loadable Software

⋮

Summary

- Two Notices Related to FLS
 - N8110.77/95* - Guidelines for Approval of FLS
 - N8110.79/93* - Guidelines for PMA via Identity for FLS
 - Reference DO-178B, Part 21, and Order 8110.42
 - Notices to be included in FAA Software Mega-Order

25